AIR QUALITY ASSESSMENT REGIMES STATUS REPORT FOR MALTA

ENVIRONMENT & RESOURCES AUTHORITY

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LIST OF ABBREVIATIONS:

EEA	European Environment Agency
ERA	Environment & Resources Authority
AAQD	Ambient Air Quality Directive
LAT	Lower Assessment Threshold
UAT	Upper Assessment Threshold
SO_2	Sulphur Dioxide

NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NO	Nitric Oxide
$PM_{2.5}$	Particulate Matter (2.5 micrometres or less)
PM_{10}	Particulate Matter (10 micrometres or less)
CO	Carbon Monoxide
Hg	Mercury
PAHs	Polycyclic Aromatic Hydrocarbons
VOCs	Volatile Organic Compounds

1. INTRODUCTION

This report is being prepared in line with the requirements of Article 5 of the Ambient Air Quality Directive 2008/50/EC, relating to the revision of the assessment regimes which are to be reviewed every five years. As part of the annual air quality reporting to the EEA, Member States must provide a report every five years compiling status updates about the air quality network. The aim of this first compiled report for Malta is to provide the country's history of the monitoring network, as well as the pollutants' level exceedances according to the assessment thresholds values and exceedances reported in the last five years. This report also provides information about Malta's monitoring stations and their classifications. An insight to the diffusion tube network is also included, with historical data maps showing how concentration levels have changed along the years.

2. SETTING UP OF MONITORING NETWORK

Annex II Section B of Directive 2008/50/EC states that the determination of exceedance of the Lower Assessment Threshold (LAT) or Upper Assessment Threshold (UAT) can be demonstrated using at least five years of contiguous and continuous monitoring data. To this effect, the setting up of a monitoring network was crucial for Malta.

In order to fulfil this obligation, a preliminary assessment of air quality within Malta was conducted by B. Stacey and Tony Bush in 2002.[1] The objective of the preliminary assessment was to establish estimates for the overall distribution and levels of pollutants, and to identify monitoring necessary to fulfil obligations to The Air Quality Framework and subsequent Daughter Directives at the time, which are now combined into the Ambient Air Quality Directive 2008/50/EC (except for certain metals and PAHs).

3. ZONES AND AGGLOMERATIONS IN MALTA

3.1 DECLARATION OF ZONES AND AGGLOMERATIONS IN MALTA

The general demography of urban areas within Malta is more densely populated than other European countries. The island as a whole is listed as the Member State with the highest population density according to Eurostat data (https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20170921-1, 2017) and it is also the 9th most densely populated territory in the world. Within the main cities and urban areas, there is a clear absence

[1] A preliminary assessment of air quality within Malta has been conducted for the pollutants regulated by the 1st, 2nd and 3rd Daughter Directives on ambient air quality. A requirement for Member States to conduct a preliminary assessment of air quality is specified by Article 5 of The Framework Directive (Council Directive 96/62/EC).

Link to document: https://era.org.mt/wp-content/uploads/2019/05/Preliminary-assessment-of-air-quality-in-Malta.pdf

of the suburban fringe demographic characteristics of many European cities. As a result, there is the potential for significant numbers of the population to be exposed to health risks from air pollution exposure. In order to delineate the extent of the zones and agglomerations within Malta, the main urban areas and archipelago coastline were assessed within a Geographical Information System (see Figure 1). A UK-based approach to delineation of continuous urban areas has been applied to Maltese urban areas. This technique attempts to identify continuous urban land by applying a 100m buffer zone to all urban areas (see Figure 2). Hence, urban areas separated by less than 200m can be highlighted as part of the same continuous urban area. After completion of this analysis, it was identified that the most significant continuous urban area in Malta comprised of Valletta, Sliema districts and some surrounding environs (see Figure 3). This urban area has been identified as the Maltese agglomeration and has a population of greater than 250,000 inhabitants. All other territories and urban areas outside of this agglomeration form part of the Maltese zone. Malta also has a third zone which incorporates the whole island along with Gozo within it for the monitoring of PAHs. The PAH zone was created after it was noticed that PAHs levels in the agglomeration and Maltese zone were significantly below the LAT. As indicated in Section 4 of Annex 3 of the Daughter Directive 2004/107/EC, if the UAT for PAHs is exceeded, Member States should have a number of sampling points according to the population of the zone. The minimum number of sampling points as derived from this section should be one if the population does not exceed 749,000 habitants. For this reason, the PAH zone was established.

For the protection of human health, Stacey and Bush, 2002 considered that under the specific definitions presented by the Directive 2008/50/EC (Annex III, Section B, part 2.), the ecosystems and vegetation limit values should not be applied within Malta due to the fact that there are no areas in the Maltese territory outside a buffer zone of 5km from urban areas, motorways and major points sources and/or at a distance of at least 20km from the agglomeration.

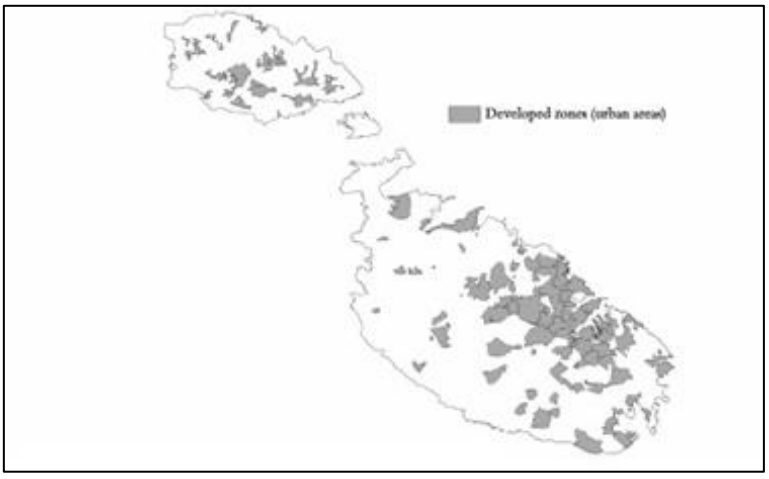

Figure 1: Assessment of the main urban areas and archipelago coastline done for the Preliminary Assessment report in 2002.

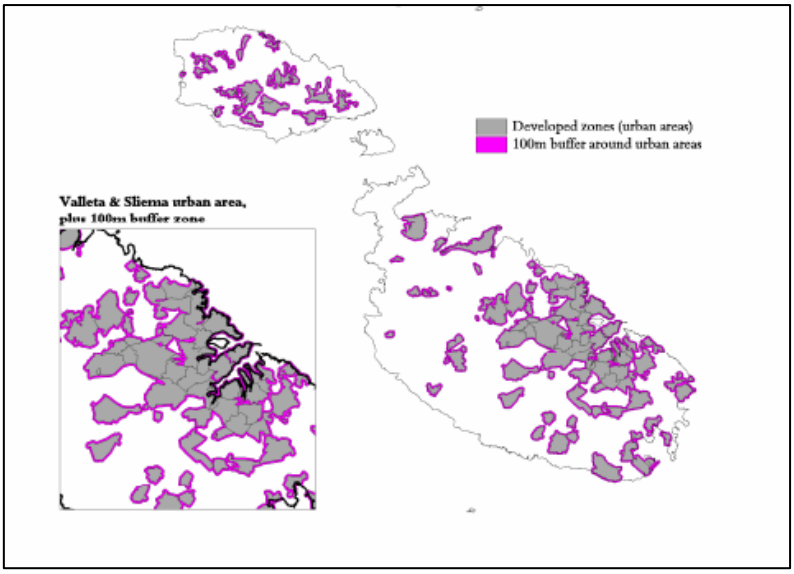

Figure 2: Identification of continuous urban land with a 100m buffer zone applied, done for the Preliminary Assessment report in 2002.

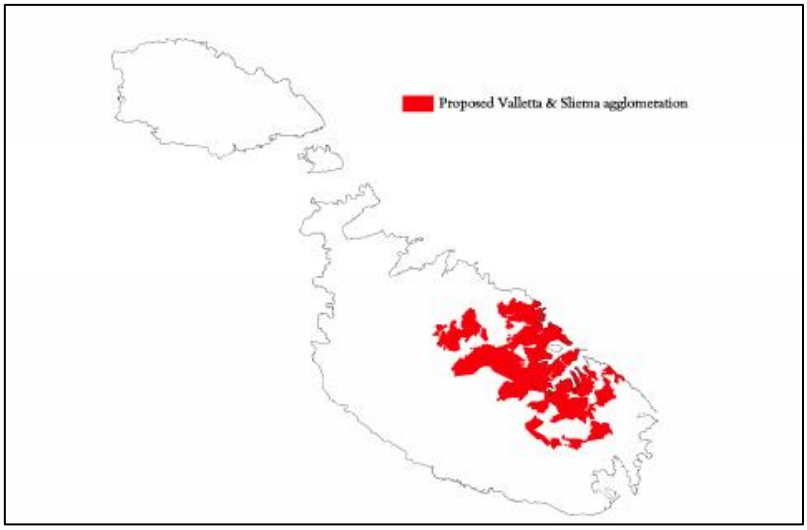

Figure 3: The proposed Valletta and Sliema agglomeration as presented in the Preliminary Assessment report in 2002.

3.2 FUTURE PLAN FOR THE MALTESE ZONE & AGGLOMERATION

Changes of many important parameters directly related to the state of the air quality, such as urban development zones and population density, occurred during these last two decades. In this light, the Environment and Resources Authority decided to update the current zone and agglomeration defined in 2002 according to the last available datasets on the pollutant levels, land uses and population.

This decision was based on the following:

i. The area established as the "agglomeration" in 2002 is a complex and discontinuous area that is not coincident with a local administration, like district or locality, and it is also susceptible to continuous changes. In particular, built-up areas have increased quite significantly during these last years.

ii. The procedures applied in 2002 to define the areas that were proposed for the agglomeration, did not take into account quantitative parameters like population density into a certain level of detail. Those parameters are important indices to distinguish rural from urban areas as requested by point five of the preliminary considerations listed in Directive 2008/50/EC. A common approach to the assessment of ambient air quality should be followed according to common assessment criteria. When assessing ambient air quality, account should be taken of the size of populations and ecosystems exposed to air pollution. It is therefore appropriate to classify the territory of each Member State into zones or agglomerations reflecting the population density.

4. DIRECTIVES 2008/50/EC AND 2004/107/EC

According to Directive 2008/50/CE (as transposed into National law by Subsidiary Legislation 549.59) and Directive 2004/107/EC Member States are obliged to assess pollutants for each zone against an assessment threshold and define the way of assessing ambient air quality for each group of pollutants. The UAT and LAT specified in Section A of Annex II of Directive 2008/50/EC shall apply to Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2), and oxides of Nitrogen (NO_X), Particulate Matter ($PM_{2.5}$ & PM_{10}), Lead, Benzene and Carbon monoxide (CO) (Table 1). Target values and long-term objectives regarding Ozone levels have to also be assessed accordingly (Table 2).

Additionally, classifications of sampling points shall be reviewed at least every five years according to the procedure mentioned in the AAQD. In the case of any changes in activities related to air pollutants, these classifications are to be reviewed more frequently.

Moreover, in Section 1 of Annex 5 in the AAQD a criteria is established for determining the minimum number of sampling points for the measurement of concentrations of the regulated pollutants for the protection of human health and also for the protection of vegetation in zones other than agglomerations. The minimum number of sampling points for all the pollutants except for Ozone, depends on whether the maximum concentration either exceeds the UAT or lies between the LAT and UAT. As for Ozone, Annex 9 of the AAQD states the criteria of the minimum number of sampling points required for fixed continuous measurements, which is based on the population number for the agglomeration and other zones and also based on the size of the area (km^2) covered by the rural background; therefore, a minimum of one sampling point in a rural background station is required. As a Member State, Malta had four fixed monitoring stations operational for the 2021 reporting cycle (reference year 2020). To date, the number of sampling points is above the minimum requirement for most regulated pollutants, which is two sampling points for SO_2, NO_2, Lead, Benzene, CO and O_3, and two monitoring stations

for particulate matter (PM_{10} and $PM_{2.5}$ combined). Malta also applies deduction of Sahara dust and sea salt from PM_{10} values, in order to confirm compliance with the respective limit values (reports can be found here: https://era.org.mt/publications/).

Pollutant	Metrics	LAT	UAT	Objective	Zone Status Population no.:	Agglomeration Status Population no.: 245,054	PAH Zone Status Population no.: 450,415
Sulphur dioxide SO_2	24-hour mean	50 µg/m^3	75 µg/m^3 (3x allowed)	Health	Below LAT	Below LAT	
	Winter mean	8 µg/m^3	12 µg/m^3	Vegetation	Below LAT		
Nitrogen dioxide NO_2	Hourly mean	100 µg/m^3	140 µg/m^3 (18x allowed)	Health	Below LAT	LAT-UAT	
	Annual mean	26 µg/m^3	32 µg/m^3		Below LAT	Above UAT	
Oxides of nitrogen NO_x	Annual mean	19.5 µg/m^3	24 µg/m^3	Vegetation	Below LAT		
Particulate Matter PM_{10}	24-hour mean	25 µg/m^3 (35x allowed)	35 µg/m^3 (35x allowed)	Health	LAT-UAT	Above UAT	
	Annual mean	20 µg/m^3	28 µg/m^3		Below LAT	Above UAT	
Particulate Matter $PM_{2.5}$	Annual mean	12 µg/m^3	17 µg/m^3	Health	Below LAT	LAT-UAT	
Lead Pb	Annual mean	0.25 µg/m^3	0.35 µg/m^3	Health	Below LAT	Below LAT	
Benzene C_6H_6	Annual mean	2 µg/m^3	3.5 µg/m^3	Health	Below LAT	Below LAT	
Carbon monoxide CO	8-hour mean	5 µg/m^3	7 µg/m^3	Health	Below LAT	LAT-UAT	
Nickel Ni	Annual mean	0.01 µg/m^3	0.014 µg/m^3	Health	Below LAT		
Cadmium	Annual mean	0.002 µg/m^3	0.003 µg/m^3	Health	Below LAT	Below LAT	
Arsenic As	Annual mean	0.0024 µg/m^3	0.0036 µg/m^3	Health	Below LAT	Below LAT	
Benzo (a) pyrene B(a)P	Annual mean	0.0004 µg/m^3	0.0006 µg/m^3	Health			Below LAT

Table 1: LAT & UAT Status for Malta (reference year 2020)

Pollutant	Metrics	LTO	TV	Objective	Zone Status	Agglomeration Status
Ozone O_3	8-hour mean	120 µg/m^3	120 µg/m^3 (25x allowed)	Health	Above LTO	Above LTO
	AOT 40 (May to July)	6000 µg.m^{-3}.h	18 000 µg/m^3	Vegetation	Above LTO	Below LTO

Table 2: LAT & UAT Status for Ozone in Malta (reference year 2020).

5. AIR QUALITY MONITORING NETWORK IN MALTA

Currently Malta has four real-time monitoring stations. They are sited in different locations with varied territorial characteristics, demography and emission sources. The identification of the monitoring stations was based on a specific assessment study done in 2002; named Preliminary assessment of air quality in Malta (Stacey & Bush, 2002). This study determined the minimum monitoring requirements to be in compliance with the Framework Directive 96/62/EC (which was the legislation in force at the time) and subsequent daughter directives (1st, 2nd and 3rd).

5.1 HISTORY OF PAST STATIONS

2004 - 2006: Floriana station, classified as a traffic site where NO_2, NO, O_3, PM_{10}, SO_2, CO, PAHs, wind speed and wind direction were monitored. This station was set up as a result of several recommendations set out in the Preliminary Assessment (Stacey & Bush, 2002). Eventually, an EU Twinning project with France (ASPA Alsace) was carried out, whereby it was concluded that the Floriana station should be moved on the basis of it being too high above street levels and within tree canopies. In the meantime, plans regarding a traffic station in Msida were already underway and in 2006 the latter replaced the Floriana station.

2004 - 2016: Kordin station, classified as an industrial station where NO_2, NO, O_3, PM_{10}, SO_2, CO, temperature, wind direction and wind speed were monitored. This station was placed downwind of Marsa Power Station, which used to operate on heavy fuel oil. Due to the complete closure of the Marsa power plant in March 2015, this station no longer had a purpose in remaining operational.

2004 – 2005: Giordan Lighthouse Station classified as rural background station for reporting of O_3. This was used temporarily to satisfy reporting obligations for O_3 in the summer months (May to September) after Malta officially joined the EU in May 2004.

2005 - 2006: San Lawrenz Station classified as urban background station for reporting of O_3. This was used temporarily to satisfy reporting obligations for of O_3 in the summer months instead of Giordan Lighthouse, as the data from this station was not available.

2005 to date: Żejtun Station classified as an urban background station.

2005 to date: Msida Station classified as a traffic station.

2007 to date: Għarb Station classified as a rural background station.

2010 to date: Attard Station classified as an urban station.

5.2 TYPES OF SAMPLING POINTS IN MALTA

5.2.1 NEAR REAL-TIME AIR MONITORING STATIONS

The Għarb monitoring station is located in the North-West part of Gozo (Figure 4). It has been classified as a rural background station because of the low industrial and human activities present on the island. Gozo's territory is prevalently formed by a rural environment with a large component of its land use dedicated to agricultural crops, which is one of the major economic activities in Gozo.

The scarcity of emission sources, along with its distance from the agglomeration and absence of human activity emission within a 1km radius from the site, makes it an ideal location to monitor the reference background air quality status for Malta. Being located in a rural area in Gozo, the main emission sources closest to this station are either of natural type (i.e. Saharan dust and sea salt) or related to agricultural activities. The site also serves as a background station to better understand the transboundary element of the relevant pollutants, especially Ozone.

The pollutants monitored at this station are as follows:

- Nitric Oxide (NO)
- Nitrogen Dioxide (NO_2)
- Nitrogen Oxide (NO_x)
- Sulphur Dioxide (SO_2)
- Ozone (O_3)
- Carbon Monoxide (CO)
- Particulate Matter ($PM_{2.5}$) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- Particulate Matter (PM_{10}) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- Volatile Organic Compounds (VOCs): Benzene, Toluene, Ethyl-benzene, M-xylene, O-xylene
- Black Carbon (automatic)
- Elemental and Organic Carbon in $PM_{2.5}$
- Ions in $PM_{2.5}$
- Bulk deposition of wet and dry Arsenic, Cadmium, Nickel and Lead and Mercury and PAHs
- This station is also equipped with meteorological sensors.

Figure 4: Location of Għarb monitoring station.

(Longitude: 14.197122 Latitude: 36.067053)

The Attard monitoring station belongs to the municipality of Attard, which is a suburban municipality in the central part of Malta. It is located on a plain, at an altitude of 85m above sea level and characterised by a population count of 11,630 (NSO population data, 2019). It has been classified as an urban station because it is situated in the North-West part of the present agglomeration. It is not particularly influenced by traffic or industrial sources and is a good representation of the state of air quality in Malta's urban environment. However, the activity within the vicinity of the station may be higher than that of an urban background station. In fact, the residential transport was defined as the principal emission source for this station.

The pollutants monitored at this station are as follows:

- Nitric Oxide (NO)
- Nitrogen Dioxide (NO_2)
- Nitrogen Oxide (NO_x)
- Ozone (O_3)
- Particulate Matter ($PM_{2.5}$) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- This station is also equipped with meteorological sensors.

Figure 5: Location of Attard monitoring station.

Longitude: 14.434347 Latitude: 35.890105

The Msida station is located on the East coast of the Maltese Islands (Figure 6). It has been classified as a traffic station within the urban agglomeration of Valletta and Sliema as it is situated in an area surrounded by a group of major roads, hence the main emission source is traffic. In further detail, this area is affected by traffic flows of around 4,700 vehicles per hour during the morning and evening rush hour periods, confirming the intense traffic activity that takes place in the city centre. In fact, Msida is populated by 15,364 habitants (NSO population data, 2019). Additionally, the city is surrounded by other important neighbouring localities, such as Ta' Xbiex, Gżira, San Ġwann, Birkirkara, Santa Venera, Ħamrun and Pieta' and is located just south-west of the capital city, Valletta therefore, can be considered a very important traffic node for commercial and communicational activities in Malta.

Moreover, Msida also lies in the Air Quality Management Area (AQMA), designated by the Minister for the Environment in December 2020[2]. The AQMA was designated to indicate the geographical area whereby emission reduction measures will be focused with the aim to reduce air pollution in the inner harbour area.

The pollutants monitored at this station are as follows:

- Nitric Oxide (NO)
- Nitrogen Dioxide (NO_2)
- Nitrogen Oxide (NO_x)
- Sulphur Dioxide (SO_2)

[2] https://era.org.mt/wp-content/uploads/2020/12/Gaz-Government-Gazette-18th-December.pdf

- Ozone (O_3)
- Carbon Monoxide (CO)
- Particulate Matter ($PM_{2.5}$) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- Particulate Matter (PM_{10}) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- Volatile Organic Compounds (VOCs): Benzene, Toluene, Ethyl-benzene, M-xylene, O-xylene
- Black Carbon
- Heavy Metals in PM_{10} including Arsenic, Cadmium, Nickel & Lead
- PAHs in PM_{10}
- This station is also equipped with meteorological sensors.

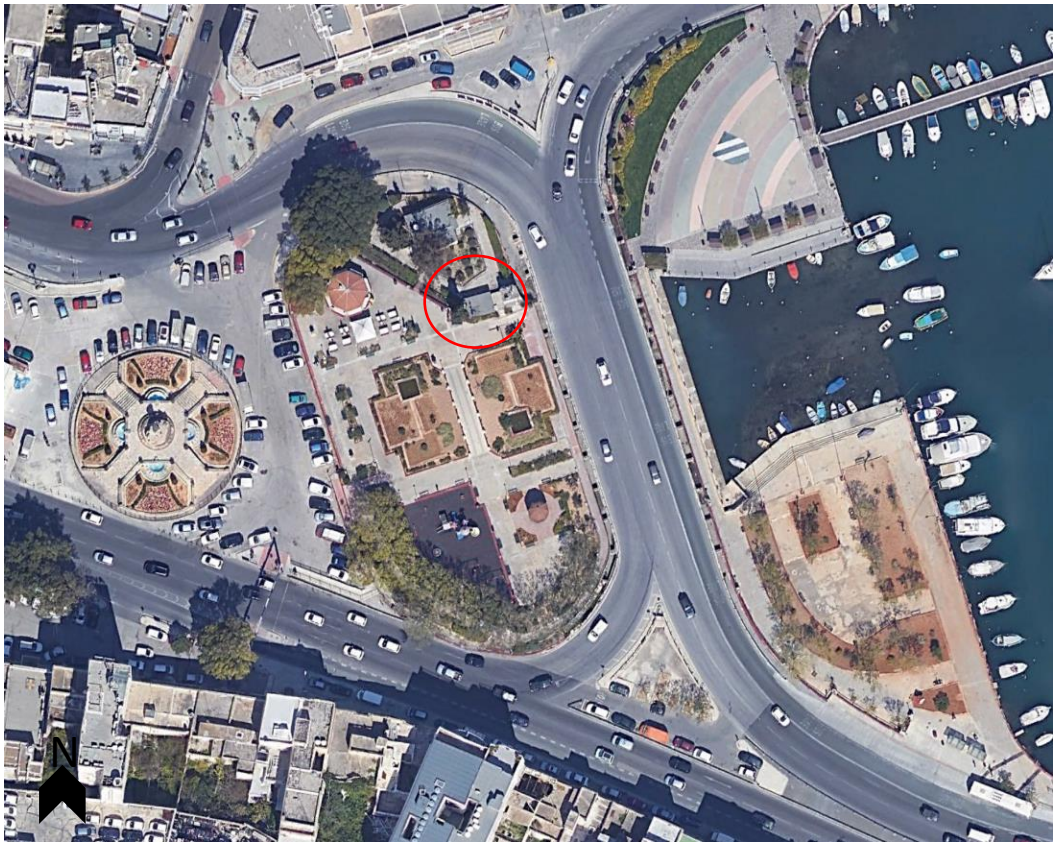

Figure 6: Location of Msida monitoring station.

Longitude: 14.489497 Latitude: 35.895912

The monitoring station in Żejtun is located in the southern part of Malta (Figure 7). It has been classified as an urban background station, within the agglomeration of Valletta and Sliema, however, it is also situated at the border between the town of Żejtun and a large agricultural and vegetated zone. Żejtun is characterised by a high

population density with 11, 533 habitants (NSO population data, 2019) and the locality provides for an important link for neighbouring localities. The station is surrounded by mostly flat areas with an altitude of approximately 56m. The station is mostly affected by anthropogenic emission sources within the agglomeration, which are then brought downwind of the prevailing west/north-westerly winds.

The pollutants monitored at this station are as follows:

- Nitric Oxide (NO)
- Nitrogen Dioxide (NO_2)
- Nitrogen Oxide (NO_x)
- Sulphur Dioxide (SO_2)
- Ozone (O_3)
- Elemental Gaseous Mercury (Hg)
- Particulate Matter ($PM_{2.5}$) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- Particulate Matter (PM_{10}) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- Heavy Metals in PM_{10} including Arsenic, Cadmium, Nickel & Lead
- This station is also equipped with meteorological sensors.

Figure 7: Location of Żejtun monitoring station.

Longitude: 14.539081 Latitude: 35.852299

In addition to these four monitoring stations, ERA has commissioned a new air monitoring station in St. Paul's Bay in December 2021 (Figures 8 & 9). According to section B in Directive 2008/50/EC "Macroscale siting of sampling points" for protection of human health under Annex III, "*Sampling points directed at the protection of human health shall be sited in such a way as to provide data on the following: (i) the areas within zones and agglomerations where the highest concentrations occur to which the population is likely to be directly or indirectly exposed for a period which is significant in relation to the averaging period of the limit value(s) and (ii) levels in other areas within the zones and agglomerations which are representative of the exposure of the general population*." To this effect, it has been decided that the monitoring station in Għarb, Gozo does not satisfy such criteria and that a new and more fitting location needed to be set up. After analysing the important factors, which needed to be taken into consideration in searching for a new location, in St. Paul's Bay is considered to be the site which is representative of the exposure of the general population found in the Maltese zone. In order to further investigate this location, ERA's mobile station was set up from January till June 2019 for temporary monitoring. After a successful period of monitoring, this site was found to be appropriate for its purpose. The monitoring station was placed as shown in Figure 8, four metres above ground level. It is surrounded by a significant road and a by-pass connecting several towns in the Northern area of the Maltese Islands as well as the traffic from Gozo heading to the centre of Malta. It is therefore considered important in analysing the impact of traffic on population exposure outside the agglomeration.

Figure 8: St. Paul's Bay monitoring station.

Figure 9: Location of St. Paul's Bay monitoring station.

Longitude: 14.385721 Latitude: 35.944801

	Station Location	Classification
Maltese Agglomeration	Msida	Traffic
	Żejtun	Urban background
	Attard	Urban
Maltese Zone	St. Paul's Bay	Traffic
	Għarb	Rural background

Table 3: Classification of ERA's monitoring stations.

5.2.2 PASSIVE DIFFUSION TUBE NETWORK

Directive 2008/50/EC defines objectives for ambient air quality designed to avoid, prevent or reduce harmful effects on human health and the environment as a whole. It also sets out measures for the assessment of ambient air quality in Member States as well as for obtaining information on ambient air quality in order to help combat air pollution and nuisance. The network of fixed air monitoring stations is set up with the aim of monitoring the levels and confirming compliance of air pollutants in line with the requirements of this directive.

In addition to the fixed air monitoring stations, a network of diffusion tubes (Figure 10) is also set up with the aim of supplementing the data from the real-time monitoring. This network is composed of 100 points at which

diffusion tubes are located to measure the concentration of nitrogen dioxide (NO_2) and volatile organic compounds (benzene, toluene, ethyl benzene, m,p-xylenes and o-xylene). A smaller network of diffusion tubes (23 points) looks into the levels of sulphur dioxide (SO_2).

The network is designed to monitor the levels of pollutants at two types of sites namely; traffic sites and urban background sites. Along the years, a number of locations have been added to the network . One other important change to the monitoring network was a change in the lab that supplied and analysed the diffusion tubes once they are exposed. From its initiation till 2013, *Gradko Environmental* were the suppliers of the diffusion tubes. However, as of 2014, the supply and analysis of the samplers was entrusted to another laboratory – *Passam AG*, a Swiss accredited laboratory.

The data generated from the diffusion tube network is used as an indication to assess the likely hotspots of air pollution. Data represents monthly averages of the concentration of a set of atmospheric pollutants. The data sets consists of 100 points around Malta and Gozo providing a good spatial resolution. The spatial resolution is an important feature of the diffusion tube network as it allows for the estimation of the concentration of pollution in areas where there is no monitoring. Through geo-statistical techniques, such as kriging interpolation, maps of pollutant concentrations are prepared as shown in Figures 11, 12 and 13. The interpolation yields a continuous surface map showing the levels of air pollutants. These maps are useful both to assess areas of high concentrations and also as baseline data for the preparation of air quality studies for development planning applications.

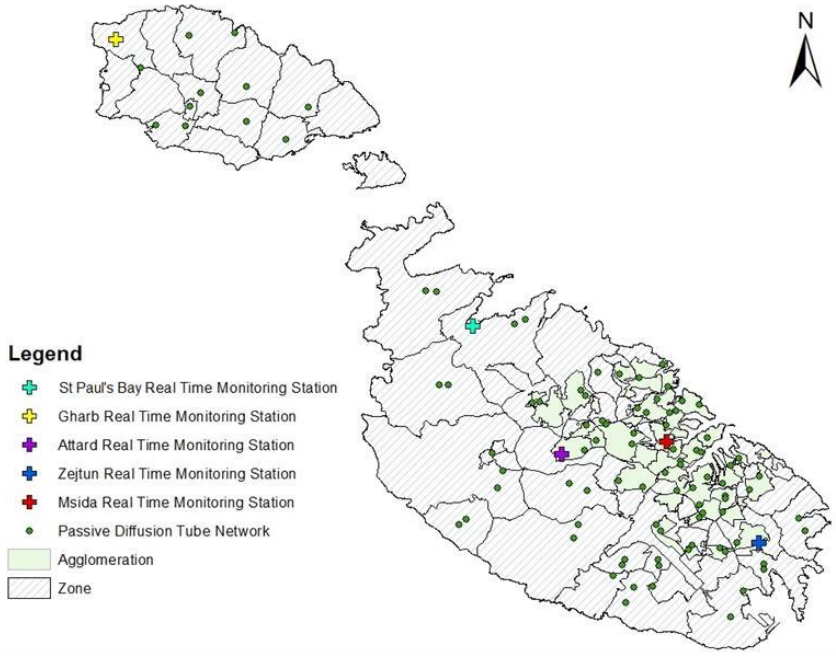

Figure 10: Map of the Maltese Islands showing the Maltese Agglomeration and locations of diffusion tubes and air monitoring stations.

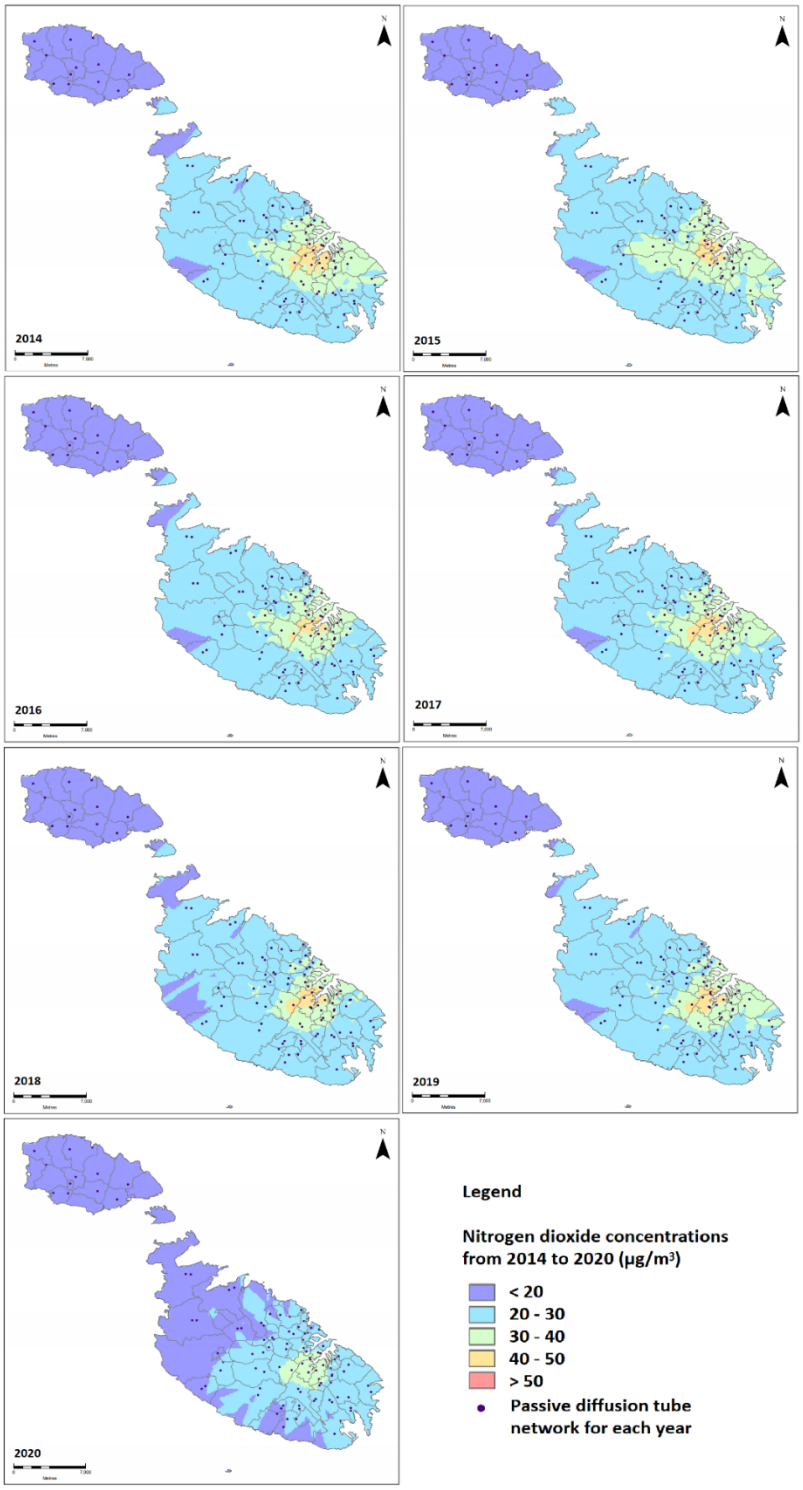

Figure 11: Nitrogen dioxide concentration maps from 2014 to 2020.

The maps in Figure 11 show levels of high NO_2 concentrations within the centre of the agglomeration with some minor variations from year to year. Significant changes can be seen in the concentrations recorded in 2020, which were the result of the restrictions put in place to control the spread of CoVID-19.

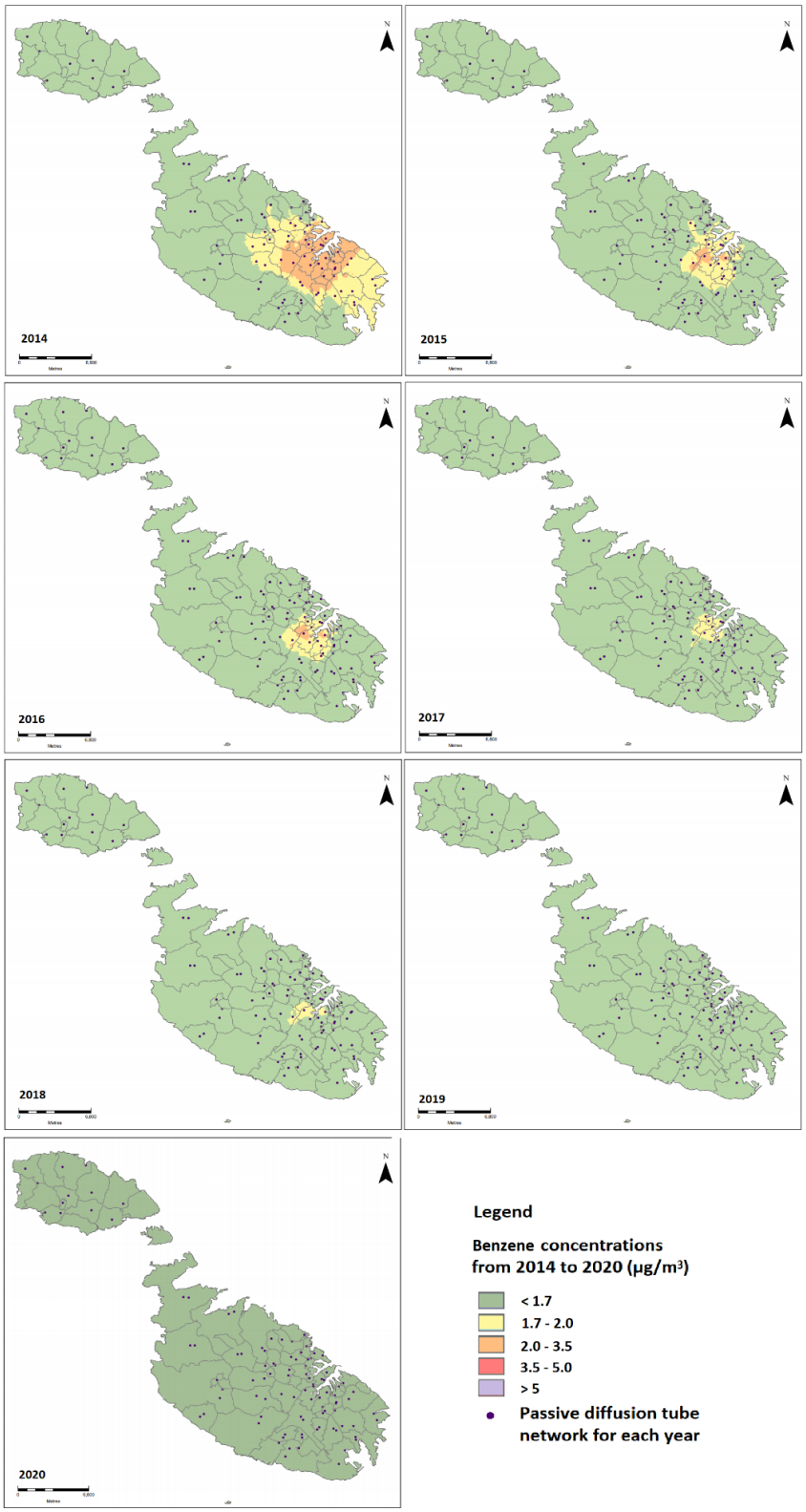

Figure 12: Benzene concentration maps from 2014 to 2020.

The maps in Figure 12 show a gradual improvement throughout the years for benzene concentrations. In the case of 2020, benzene showed the lowest concentrations overall due to the restrictions put in place in March to control the spread of CoVID-19.

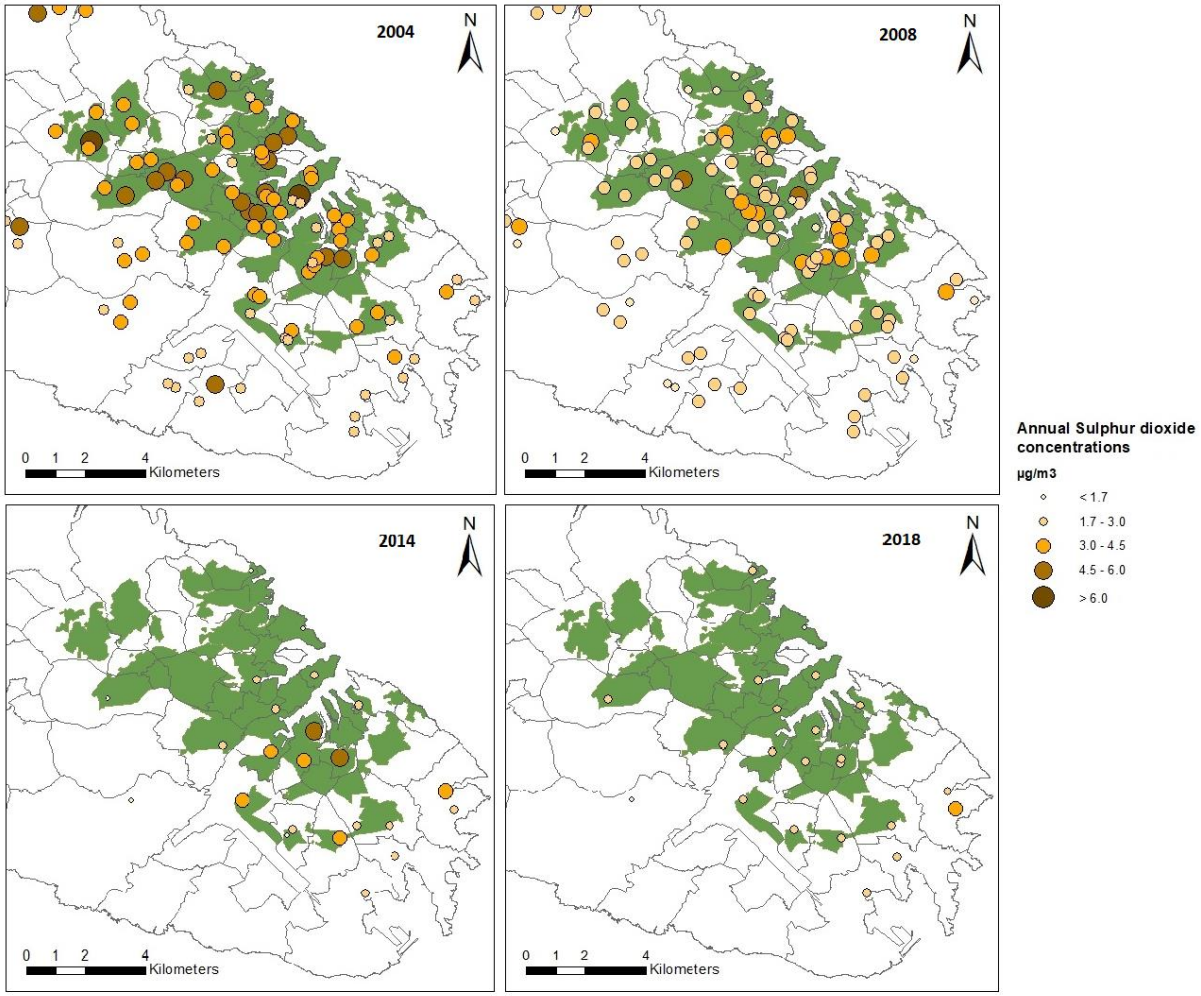

Figure 13: Sulphur dioxide concentration maps for the years 2004, 2008, 2014 and 2018.[3]

SO_2 showed very significant improvement over the last seven years (Figure 13) due to reduction of sulphur content in fuel, as well as phasing out the use of heavy fuel oil in 2017 and shifting to natural gas for electricity generation.

[3] The years chosen to show SO_2 concentrations in Figure 13 have been chosen for two main reasons. Firstly, 2004 and 2008 SO_2 concentrations were used to show any differences between the Gradko diffusion tubes used during these years vs the Passam diffusion tubes, which were introduced in 2014. Additionally, following the change to natural gas at Delimara power station in 2017, concentrations for 2018 show the significant decrease in SO_2 levels brought about by the phasing out of heavy fuel oil.

5.2.3 MOBILE STATION

As part of the monitoring network, ERA also has a mobile station (Figure 14) equipped with analysers and meteorological sensors to monitor the air quality in different locations as needed. This mobile station van helps serve as a temporary way of monitoring whenever preliminary monitoring is needed before certain projects are carried out. The following are a few examples of when the mobile station has been used;

- Short-term monitoring sessions in Naxxar to understand any impacts from nearby quarries.
- Temporary monitoring carried out next to a primary school in Mtarfa, which is near to a number of quarries.
- Preliminary monitoring for 5 months in St. Paul's Bay prior to the setting up of a permanent monitoring station.
- Currently located in Senglea downwind of the Grand Harbour to monitor ship emissions affecting the surrounding towns (Figure 14).

The pollutants, which can be monitored at this station are as follows (depending on the nature of prevailing emission sources):

- Nitric Oxide (NO)
- Nitrogen Dioxide (NO_2)
- Nitrogen Oxide (NO_x)
- Sulphur Dioxide (SO_2)
- Carbon Monoxide (CO)
- Particulate Matter ($PM_{2.5}$) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- Particulate Matter (PM_{10}) by both gravimetric method according to EN 12341 and automatic analysis by real-time data
- This station is also equipped with meteorological sensors.

Figure 14: ERA's mobile station.

6. CONCLUSIONS

Malta's air quality monitoring network is adequate and fulfils the Ambient Air Quality Directive's requirements in terms of number of sampling points for the regulated pollutants. Since the Authority's new monitoring station in St. Paul's Bay is representing the general population in the Maltese Zone, it will provide further information about the air quality situation in Malta as a whole. The monitored data gathered from this station along with the other stations will serve as a tool in updating Malta's Zone and Agglomeration, which is required in order to reflect the increased built-up areas and population number. Overall trends also show a decrease in most regulated pollutants, however, one has to keep in mind that due to the restrictions put in place in 2020 to control the spread of CoVID-19, some trends may need to be analysed further when there are less restrictions, so as to have more valid results.

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